

APPENDIX A



MATERIAL SAFETY DATA SHEET

Gelcarin® ME 8121 Carrageenan

FMC BioPolymer

MSDS Ref. No.: 1327
Date Approved: 06/11/2004
Revision No.: 2

This document has been prepared to meet the requirements of the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200; the Canada's Workplace Hazardous Materials Information System (WHMIS) and, the EC Directive, 2001/58/EC.

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	Gelcarin® ME 8121 Carrageenan
CHEMICAL FAMILY:	Polysaccharides
SYNONYMS:	Carrageenan: Chondrus Crispus (Carrageenan)(INCI name), Carrageenin, Irish moss extract, Condrous extract
GENERAL USE:	Foodstuff application

MANUFACTURER

FMC BioPolymer
1735 Market Street
Philadelphia, PA 19103
(800) 526-3649 (General Information)

FMC Europe NV
Avenue Mounier 83
1200 Brussels, Belgium
+32 2 / 775 8311 (General Information - Brussels)

EMERGENCY TELEPHONE NUMBERS

(800) 424-9300 (CHEMTREC - U.S.)
(202) 483-7616 (CHEMTREC - All Other Countries)
(303) 595-9048 (Medical - U.S. - Call Collect)

(207) 594-3200 (Plant - Rockland, ME)

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

- Dry powder with a slight marine odor.
- Powder becomes slippery when wet.
- Accumulation of overhead settled dust may form explosive concentrations in air when disturbed and dispersed.

POTENTIAL HEALTH EFFECTS: No significant health hazard expected.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt. %	EC No.	EC Class
Carrageenan	9000-07-1		232-524-2	Not classified as hazardous

4. FIRST AID MEASURES

EYES: Flush with water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

SKIN: Wash with plenty of soap and water.

INGESTION: Drink plenty of water. Never give anything by mouth to an unconscious person. If any discomfort persists, obtain medical attention.

INHALATION: Remove to fresh air. If breathing difficulty or discomfort occurs and persists, contact a medical doctor.

NOTES TO MEDICAL DOCTOR: This product has low oral, dermal and inhalation toxicity. It is non-irritating to the eyes and skin, and non-sensitizing to the skin. Treatment is symptomatic and supportive.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Water, carbon dioxide.

FIRE / EXPLOSION HAZARDS: As with any fine particulate matter, the accumulation of excessive dust on overhead structures may form explosive concentrations when disturbed and dispersed.

FIRE FIGHTING PROCEDURES: For fires involving this material, do not enter any enclosed or confined fire space without wearing full protective clothing and self-contained breathing apparatus (SCBA) approved for firefighting. This is necessary to protect against the hazards of heat, products of combustion and oxygen deficiency. Do not breathe smoke, gases or vapors generated.

FLAMMABLE LIMITS: Not applicable

6. ACCIDENTAL RELEASE MEASURES

RELEASE NOTES: Powder becomes slippery when wet. Maintain good housekeeping practices to minimize accumulation of settled dust, especially on overhead surfaces. Sweep up the spilled material and dispose of in accordance with the waste disposal method outlined in Section 13, "Disposal Considerations" below.

7. HANDLING AND STORAGE

HANDLING AND STORAGE: Use local exhaust or general dilution ventilation to control exposure to dust. Always use safe lifting techniques when manually moving containers, especially when handling containers weighing more than 50 pounds (22.7 kg). To protect quality, store in a tight container in a cool, dry place. Avoid exposure to excessive heat.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Whenever airborne dust concentrations are high, appropriate protective eyewear, such as mono-goggles, should be worn to prevent eye contact.

RESPIRATORY: Whenever dust in the worker's breathing zone cannot be controlled with ventilation or other engineering means, workers should wear respirators or dust masks approved by NIOSH/MSHA, EU CEN or comparable certification organization to protect them against airborne dust.

PROTECTIVE CLOTHING: No special clothing is required.

GLOVES: No special gloves are required.

COMMENTS:

EXPOSURE LIMITS:

Particulates Not Otherwise Classified (PNOC):

ACGIH/TWA

10 mg/m³ (inhalable particulate)

3 mg/m³ (respirable particulate)

9. PHYSICAL AND CHEMICAL PROPERTIES

ODOR:	Slight marine
APPEARANCE:	Dry powder
AUTOIGNITION TEMPERATURE:	Not applicable
BOILING POINT:	Not applicable
COEFFICIENT OF OIL / WATER:	(Octanol/Water) Not applicable
EVAPORATION RATE:	(Butyl acetate = 1) Not applicable
FLASH POINT:	Not applicable
FREEZING POINT:	Not applicable
MELTING POINT:	Not applicable
pH:	7.0 - 10.5 (1.5% solution)
SOLUBILITY IN WATER:	(% by weight) 10% maximum
SPECIFIC GRAVITY:	(H ₂ O = 1) Approximately 1 g/cc
VAPOR PRESSURE:	Not applicable

10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	None known
STABILITY:	Stable
HAZARDOUS DECOMPOSITION PRODUCTS:	Will produce oxides of sulfur on burning.

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS: Non-irritating (rabbit)

SKIN EFFECTS: Non-irritating (rabbit)

DERMAL LD₅₀: > 2,000 mg/kg (rabbit)

ORAL LD₅₀: > 5,000 mg/kg (rat)

INHALATION LC₅₀: > 0.93 mg/l (4 h) (rat) Maximum attainable concentration - zero mortality

SENSITIZATION: (Skin) Non-sensitizing (guinea pig)

ACUTE EFFECTS FROM OVEREXPOSURE: This product has low oral, dermal and inhalation toxicity. It is non-irritating to the eyes and skin, and non-sensitizing to the skin. No significant acute toxicological effects are expected.

CHRONIC EFFECTS FROM OVEREXPOSURE: Long term and lifetime feeding studies with carrageenan in laboratory animals were negative, as were reproductive outcomes and mutagenicity studies.

CARCINOGENICITY:

NTP:	Not listed
IARC:	Not listed
OSHA:	Not listed
OTHER:	Not Listed (ACGIH)

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: No data available for the product. This product is not expected to have significant environmental effects.

ECOTOXICOLOGICAL INFORMATION: Carrageenan is an extract of seaweeds of the class Rhodophyceae (red seaweeds), and is not expected to have significant toxicity to aquatic organisms.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: No special disposal methods are suggested. It is the user's responsibility to comply with all applicable local, state, and federal laws, rules, regulations and standards.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

MARINE POLLUTANT:	None
ADDITIONAL INFORMATION:	Not listed in Title 49 of the U.S. Code of Federal Regulations as a hazardous material.

Stabilizer / emulsifier; water soluble, dry

INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG)

ADDITIONAL INFORMATION:

Not applicable

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO) / INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

ADDITIONAL INFORMATION:

Not applicable

OTHER INFORMATION:

Canada (TDG) : Not applicable

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355, APPENDIX A):

Not applicable

SECTION 311 HAZARD CATEGORIES (40 CFR 370):

Not applicable

SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370):

The Threshold Planning Quantity (TPQ) for this product, if treated as a mixture, is 10,000 lbs; however, this product contains the following ingredients with a TPQ of less than 10,000 lbs.:

None

SECTION 313 REPORTABLE INGREDIENTS (40 CFR 372):

This product does not contain any toxic chemicals subject to the reporting requirements of Section 313, Title III of the SARA (Superfund Amendments and Reauthorization Act) of 1986.

CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)

CERCLA DESIGNATION & REPORTABLE QUANTITIES (RQ) (40 CFR 302.4):

Not applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)**TSCA INVENTORY STATUS (40 CFR 710):**

Listed

CANADA**WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):**

Not a controlled product under the Canadian Workplace Hazardous Materials Information System (WHMIS).

Domestic Substance List: Listed

E NUMBERS:

E 407

INTERNATIONAL LISTINGS

Carrageenan
Australia (AICS): Listed
China: Listed
Philippines (PICCS): Listed

ADDITIONAL REGULATORY INFORMATION:

U.S.A.: This product is permitted for use in food under Title 21 of the Code of Federal Regulations. Refer to Regulations for specific information on use in foods.

EU: This product is permitted for use in food under the Miscellaneous Additives Directive. Refer to Directive for specific information on use in foods.

16. OTHER INFORMATION**NFPA**

Health	1
Flammability	1
Reactivity	0
Special	None

No special requirements

NFPA = National Fire Protection Association

Degree of Hazard Code:

4 = Extreme

3 = High

2 = Moderate

1 = Slight
0 = Insignificant

REVISION SUMMARY:

This MSDS replaces Revision #1, dated August 26, 2002.

Changes in information are as follows:

New Format, as well as:

Section 1 (Product and Company Identification)

Section 3 (Composition / Information on Ingredients)

Section 15 (Regulatory Information)

Section 16 (Other Information)

Gelcarin and FMC BioPolymer Logo - FMC Trademarks

© 2004 FMC Corporation. All Rights Reserved.

capsicum oleoresin	
Synonyms :	cayenne oleoresin
Odor Description :	Chilis Musty Hay Tobacco Sweet Herbal
Appearance :	Dark Red Viscous Liquid
Nafta H. # :	3301.90.1000
Cas. # :	8023-77-6
Fema # :	2234
FDA RegNum :	182.20
Flash point (Deg. F.) :	> 200.00 °F. TCC (> 93.33 °C.)
Toxnet	
Soluble in :	Vegetable Oils
Insoluble in :	Water
Information Only. Not sold by The Good Scents Company.	
Description :	Capsicum Oleoresin is a dark red or orange red to brownish red liquid, soluble in ethyl ether and most vegetable oils, but not in alcohol.

Please share your Information / Comments.

[Top of Page](#)

[Copyright](#) © 1994-2005 The Good Scents Company [Disclaimer](#)
Html Last modified 11/18/2005

APPENDIX B

U.S. Food & Drug Administration
Center for Food Safety & Applied Nutrition

FDA Technical Bulletin Number 5

Macroanalytical Procedures Manual

1984; Electronic Version 1998

V. MACROANALYTICAL METHODS

4. CHOCOLATE, SUGARS, AND RELATED PRODUCTS

A. *METHOD FOR COCOA BEANS* (V-18)

(1) Scope

This method specifies procedures applicable to the analysis of raw cocoa beans to determine:

- Defects within individual beans due to insect infestation, molds, or other causes (these are expressed as percentages of reject beans by number and type of defect)
- General contamination of a lot by rodents, insects, molds, foreign matter from spillage and sweeps, or by other cause

(2) Applicable Documents

- a. CPG 7105.12 Defect Action Levels for Cocoa Beans
- b. CPG 7119.08 Coffee and Cocoa Bean Sweeps
- c. CPG 7103.01 Food Storage and Warehousing

(3) Defects

a. *Insect Infestation and Damage* -- Although a number of major insect pests (Families Aphididae, Miridae, Coccidae, etc.) infest cocoa in the field, insect damage in imported beans is primarily the result of insect attack in the stored product. Some of the most serious of these insect pests are the phycitid moths such as the tropical warehouse moth or almond moth [*Cadra cautella* (Walker)]; the tobacco moth [*Ephesia elutella* (Hübner)]; and the Indianmeal moth [*Plodia interpunctella* (Hübner)]. Important beetle pests are the coffee bean weevil [*Araecerus fasciculatus* (DeGeer)], the cigarette beetle [*Lasioderma serricorne* (Fabricius)], and some species of Dermestidae. Extensive internal damage to the beans may occur during the larval feeding stage of *C. cautella*, *E. elutella* and *A. fasciculatus* in the warehouses of producing countries. All of the pests of stored products mentioned, together with a number of secondary pests such as the foreign grain beetle [*Ahasverus advena* (Walt)], the Mediterranean flour moth [*Anagasta kuehniella* (Zeller)] and driedfruit beetle [*Carpophilus hemipterus* (Linnaeus)] may infest the beans during drying (curing), transportation, and storage, producing variable degrees of damage.

b. *Moldiness of Fungal Decay* -- Species of molds which appear in beans as a visible growth in the nibs (cotyledons) belong to three classes of fungi: Phycomycetes, Ascomycetes, and Fungi Imperfecti. Within the Phycomycetes, *Mucor* sp. and *Circinella* sp. produce a coarse weblike growth of mycelial strands scattered over the surface. *Eurotium repens* of the Ascomycetes is frequently found; it produces a thick matted mass of mycelial growth containing small, round yellowish bodies (the ascocarps) which are readily visible when the bean is cracked open. The ascocarps are scattered throughout the mycelium both on the surface of the cotyledons and between the folds. Among the Fungi Imperfecti, species of *Aspergillus* are most commonly found. *A. flavus* produces a dark grayish-green mass of mycelium and spores and, in cases of thick matted growth on the surface of the cotyledons, a dusty mass of spores arises when the bean is cracked open. *A. tamarii* produces a dark brown mass of mycelium and spores. *A. niger* occurs only occasionally and produces a dark-colored area on the bean caused by the production of a mass of blackish brown spores. These aspergilli are associated with cocoa beans having a high moisture content. Aspergilli contamination indicates poor drying and storage practices. The extent of mold damage to individual beans can vary widely. In some beans a few hyphal strands may be present, while in extreme cases the inside of the bean may be completely covered with a thick matted mass of mold filaments and masses of spores accompanied by visually apparent disintegration of the cocoa bean tissue. Between these extremes, defective beans may exhibit any gradation of contamination by invading molds.

(4) Procedure: Determination of Insect-Damaged and Moldy Cocoa Beans

a. *Sample Preparation* -- A sample consists of a representative number of subsamples from the lot. Each subsample should contain about 1 lb of beans composited by taking about 1/3 lb from each of 3 bags or other containers in the lot. Mix each subsample and count out 100 beans. If subsamples are composited for analysis, take equal amounts from each subsample and mix thoroughly.

b. *Visual Examination* -- Crack open each bean and break into small pieces (nibs) along the natural folds of the cotyledons to expose the internal surfaces of the nibs.¹ Examine each bean in a good light without the aid of a magnifier² and classify according to (4)c.

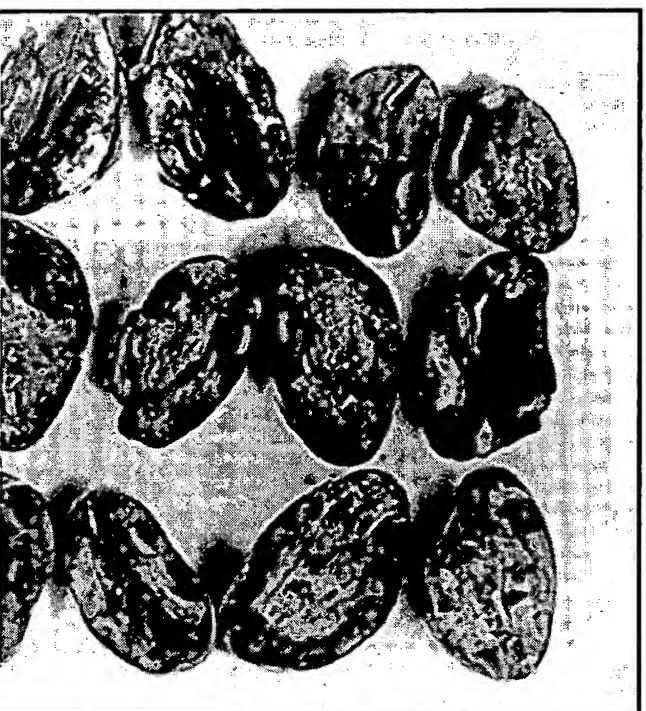
c. Classification of Reject Beans -- Beans should be classified as follows:

(i) *Moldy* -- Any bean showing extensive mold affecting 1/4 or more of the exposed nib material. Do not classify as moldy any beans with:

- Small, localized areas of mold, usually in the germ (broader) end of the bean
- Localized spots of spores around the germ or radicle
- Light, feathery mold
- Exterior mold only, limited to the removable shell or seed coat
- Grayish-blue (slate-colored) appearance but no mold filaments

Figure V-4 illustrates cocoa bean rejects due to mold.

Figure V-4



COCOA BEAN REJECTS DUE TO MOLD

¹Examination of beans can be accomplished with facility by using a cracking board made from a 15 in. square sheet of 1/4 in. aluminum or plywood drilled with one hundred 7/8 in. holes, equally spaced in 10 rows of 10 holes each. Place the board on a large sheet of paper on a hard surface. Scatter the beans on the board to fill the holes. Sweep the excess beans off with the hand and adjust any empty or double-filled holes so that each of the 100 holes contains one bean. Crack open each bean by placing an iron bolt (about in. in diameter and about 3 in. long) on the bean and gently tapping the head of the bolt with a hammer.

²Magnifiers may be used by analysts to confirm the identification of conditions initially observed by the unaided eye. Magnifiers may also be used for familiarization with the range of damage characterizing specific lots.)

(ii) *Insect Infested or Insect Damaged* - any bean showing insects (fragments or whole insects), insect excreta, webbing, or tunneling. Describe kind and extent of insects present in subsample under "Remarks" in (4)d.

(iii) *Moldy and Insect Infested or Insect Damaged* -- any bean that is both moldy and insect infested or insect damaged.

d. **Report** -- Record results of examination as follows:

Code or Lot No. _____	Subsample No.			
	1	2	3	etc.
No. of insect-infested beans				
No. of moldy beans				
No. of moldy and insect-infested beans				
Total Rejects				
Remarks:				

(5) **Procedure: Determination of Extraneous Material in Cocoa Beans**

a. **Sample Preparation and Visual Examination** -- Weigh the sample or subsamples as submitted. Screen entire contents of each on a No. 3 sieve to sift out live or dead insects and other foreign matter from the cocoa beans. Examine siftings for presence of insects, rodent excreta, and other extraneous material. Classify any filth or extraneous material into suitable descriptive categories and record by number or weight, as appropriate. Record number and kind of insects, noting whether alive or dead, number and weight of rodent and other animal excreta, and give a suitable description of other extraneous contaminants.

b. **Report** -- Tabulate and report amounts of each category of filth and extraneous matter per weight of sample or subsamples.

REFERENCES

- (1) Chadd, Eileen M., *Cocoa -- Cultivation, Processing and Analysis*, Interscience Publishers, Inc., New York, 1953.
- (2) Gecan, J. S., and P. M. Brickey, Jr. "Cocoa Bean Histology and Comparative Micromorphology of Internal Bean Infesting Insects," U.S. Food and Drug Administration, Internal Bulletin, Washington, DC, 1967.
- (3) *Cocoa Bean Import Survey 1959-1960*, U.S. Department of Health, Education, and Welfare, Food and Drug Administration, Washington, DC.

Table of Contents

4. CHOCOLATE, SUGARS, AND RELATED PRODUCTS

B. METHOD FOR CANDY (V-22)

(1) Scope

This method describes a general macroscopic procedure applicable to most candy products for determination of relatively obvious extraneous contamination. The term "candy" includes a wide variety of products manufactured from diverse ingredients. The type and extent of contamination in a finished product may vary substantially, depending on the ingredients used. Each ingredient introduces the potential for contamination due to distinct sources associated with its production, transport, and storage prior to incorporation into the candy product. Selection of a suitable method for analysis of any specific product material should therefore take into account the ingredients in the product as well as the techniques used in its production and storage. Additional methods for utilizing various selective digestion techniques to recover microscopic particulate and extraneous contaminants from candy are available in AOAC.

(2) Applicable Documents

(3) Defects

Because each raw material and processing method has unique contamination problems, it is essential to review the establishment inspection report and relevant defect profiles of product ingredients in order to identify likely routes of contamination and to determine suitable analytical procedures. Ingredients which are incorporated into a candy product with only slight changes in physical character may be easily separated from the product for selective analysis to detect visible moldy or insect-damaged portions. In some cases the external coating, such as chocolate, may be the suspect ingredient; in other cases it might be the starch-molded centers or whole nuts contained in the product. If the layers carry varying amounts and types of contaminants, they should be analyzed separately.

Where the finished candy may have become contaminated during the processing or in storage, a thorough macroscopic examination of the exterior is most important. Holes, tears, or other damage to the packaging material in which the candy is contained may occur from infestation by insects or other pests during storage. Molds may develop on the product from improper storage conditions. Other signs of contamination may include excrement from insects or rodents, insect cast skins, chewing and webbing, or other evidence of defilement.

(4) Procedure: Determination of Extraneous Contamination

a. Sample Preparation -- The sample may consist of a number of selective subsamples from suspect portions of the lot together with exhibits indicating apparent damage. Alternately, the sample may contain representative subsamples of the lot. Count and/or weigh the subsamples to be examined.

b. Visual Examination -- Before opening bulk or individually packaged candy, carefully examine the packaging material for any signs of damage by rodents, insects, or other causes. If insect-bored holes were detected, determine, if useful, whether holes were made by entrance or exit of the insects (AOAC 973.63). Examine macroscopically the entire contents of consumer size packages where portions will be selected later for microscopic analysis. For assorted candies, examine each variety separately, as appropriate. Examine the surface of the candy for gross contamination with the naked eye or by using a low-power magnifier. Cut open, as appropriate, to determine any internal damage. Describe any damage found. Note the presence of any live insects.

c. Report -- For each subsample, report defective product units or pieces according to the type of defect and determine the percent of each.

REFERENCE

Brickey, P.M., J.S. Gecan, and A. Rothschild, "Method for Determining Direction of Insect Boring through Food Packaging Materials," JAOAC 56: 640-642, 1973.

Table of contents

5. MISCELLANEOUS AND MULTIPLE FOOD PRODUCTS

A. METHOD FOR PLANT GUMS (V-24)

(1) Scope

This method describes procedures for detecting and measuring contamination caused by gross extraneous filth and/or decomposition in plant gums and for determining the percent of reject product material due to insect damage, mold or other adhering filth. The method involves direct visual examination and separation of contaminants.

Gums are hydrocolloids (hydrophilic colloids). Their water-binding properties make them an important ingredient for improving the texture of foods. The method is applicable, but not limited, to the "natural" gums listed in Table V-1.

(2) Applicable Documents

(3) Defects

Plant gums are subject to contamination by field and storage insects, birds, rodents, and other animals. Mold growth can also result from improper drying or storage conditions.

(4) Procedure: Determination of Extraneous Material Caused by Mold, Insect, and Rodent or Other Animal Contamination in Plant Gums

a. *Sample Preparation* -- Sample a representative or selective number of analytical units of the product, depending on the history of the lot. Weigh each analytical unit or subsample. Sift a minimum of 100 g from each subsample on appropriate size sieve(s) to separate whole insects, rodent excreta, and other extraneous material. State sieve size and method of use in report of results.

b. *Visual Examination and Report* -- Examine "throughs" and "overs" on the sieve(s). Follow Chapter V, Section 8A(4)b. through d. for examination, classification, and reporting of contaminants.

(5) Procedure: Determination of Insect-Damaged, Moldy, and Otherwise Reject Product Material in Plant Gums

a. *Sample Preparation* -- From each subsample weigh 100 g of material remaining from Procedure (4) as the analytical unit. Depending on the size of gum pieces, the sieve "overs" may provide this analytical unit. Alternatively, draw a separate analytical unit of 100 g from the original subsample. State how analytical unit is taken.

b. *Visual Examination and Report* -- Follow Section 8.A(5)b. through d. for examination, classification, and reporting of reject product material.

REFERENCE

Light Filth in Crude Plant Gums, AOAC 969.45

TABLE V-1

NATURAL GUMS COVERED BY THE PLANT GUM METHOD

Type	Name of Gum	Source	Production
Plant Exudates	Arabic	<i>Acacia</i> species, trees	Africa
	Tragacanth	<i>Astragalus</i> species, shrubs	Asia Minor, Iran, Syria, Turkey
	Karaya	<i>Sterculia urens</i> Roxb., tree	India
	Ghatti	<i>Anogeissus latifolia</i> Wall., tree	India and Ceylon
	Pectins	Citrus species, peel, and <i>Malus sylvestris</i> Mill., apple, pomace	United States
Plant Extracts	Arabinoga-lactan (larch gum)	<i>Larix</i> species, larch trees	United States
	Locust bean (carob bean)	<i>Ceratonia siliqua</i> L., carob tree	Near East and Mediterranean
Plant Seed Flours	Guar	<i>Cyamopsis tetragonoloba</i> , (L.) Taub., guar plant	India and Pakistan
	Psyllium Seed	<i>Plantago</i> species, plantain	India and Mediterranean
	Quince Seed	<i>Cydonia oblonga</i> , Mill., quince tree	Iran
	Agar	<i>Gelidium</i> species and other red algae	Japan
Seaweed Extracts	Alginates	<i>Macrocystis pyrifera</i> (L.) C.A. Agardh. and other brown algae (kelp)	United States
	Cartageenan	<i>Chondrus</i> species, <i>Gigartina</i> species, and other red algae	Maine and Europe
	Furcellaran	<i>Furcellaria fastigiata</i> (Hudson) Lamouroux, a red alga	Denmark and Norway

Table of contents

6. DAIRY, CHEESE, AND RELATED PRODUCTS**A. METHOD FOR CASEIN AND SODIUM CASEINATE (V-26)****(1) Scope**

This method describes a procedure for determining contamination in casein and sodium caseinate caused by discrete particulate filth from insects, birds, and other sources. The method involves direct separation of contaminants from the product by screening.

Casein is a white to yellowish granular protein precipitate made from skim milk by the action of dilute acid or rennet. Sodium caseinate, a white powder, is produced by treating casein with a dilute NaOH solution and then spray-drying the soluble material.

These products are used as protein supplements in dietetic foods, bakery products, stews, and soups. Sodium caseinate is also used as a binder, emulsifier, a whipping agent in food products, and as a prime constituent of nondairy cream.

(2) Applicable Documents

- a. CPG 7106.7 Adulteration of Cheese Products with Filth

(3) Defects

These products may become contaminated with manure and plant fragments, insect and rodent filth, feathers, and other extraneous material.

(4) Procedure: Determination of Contamination Caused by Extraneous Material in Casein and Sodium Caseinate

- a. *Sample Preparation* -- Draw a representative or selective number of analytical units from the sample, depending on the history of the lot.
- b. *Visual Examination* -- Sift a minimum of 100 g of the subsample on an appropriately sized sieve. Examine for whole insects, rodent pellets, and other extraneous materials.
- c. *Report* -- Report results, using the format in AOAC 970.66B(i).

Table of contents

7. SEAFOOD

A. METHOD FOR MICROSCOPIC DETECTION OF FISH TISSUE IN CRAB MEAT OR CRAB CAKES (V-27)

(1) Scope

This method describes a microscopic procedure for the detection of fish tissues which may be substituted in whole or in part for crab meat. Crab meat products are prepared from the meat derived from any of several species of edible crabs, including blue, king, queen, tanner, Dungeness, red, and stone crabs, which are members of the Class Crustacea in the Phylum Arthropoda.

(2) Applicable Documents

a. CPG 7108.03 Seafood Products - Labeling

(3) Defect

Some manufacturers of crab cakes may add fish meat to their product. With the following method, it is possible to detect the presence of as little as 1% fish meat in experimental batches.

(4) Procedure: Microscopic Determination of Fish Tissue Added to Crab Products

a. *Sample Preparation and Visual Examination* -- Weigh subsample and place the material in a shallow dish or pan. Spread out and examine with the naked eye. The muscle fibers of cooked crab are bluish white and have a translucent appearance. Boiled fish meat has a dead or chalky white appearance. Pick out any chalky white lumps of meat for microscopic study as well as some of the non-chalky white material.

b. *Microscopic Examination* -- Mount bits of the muscle fiber in acidified chloral hydrate-glycerol solution on slides, warm slide to clear tissues, and examine with a compound microscope. The striations on the fish muscle are indistinct as contrasted with the distinct striations of crab muscle fiber. Weigh any foreign tissues found and estimate percent present in the product.

c. *Report* -- Report presence of any fish meat and the approximate percent (by weight) found.

REFERENCES

- (1) *Food Microscopy*, J. G. Vaughn, Ed., Chapter 9, "Fish," Academic Press, New York, 1979.
- (2) Freeman, C. C., "Cod or Crab," FDA Papers, Sept. 1967, pp 20-22.

Table of contents

7. SEAFOOD

B. METHOD FOR DETERMINATION OF PARASITES IN FIN FISH (V-28)

(1) Scope

This method describes procedures for the determination of parasites in fish by visual examination. Gross visual examination is effective when the parasites are visible on the exposed surfaces of the fish or when the fish flesh is sufficiently transparent for the parasite to be seen against the background of food material. Up to 95% of the parasitic nematodes recovered by methods for digestion of fish can be detected by macroscopic examination. Macroscopic examination for parasites may be performed in conjunction with organoleptic examinations for decomposition.

(2) Applicable Documents

- a. CPG 7108.05 Defect Action Level - Decomposition
- b. CPG 7108.06 Defect Action Level - Parasites

(3) Defects

Parasites in the edible flesh of fish are a naturally occurring defect. Among the parasites that infest fin fish are species of the Protozoa, three phyla of helminths and the parasitic copepods of the Class Crustacea.

a. Protozoa -- Although protozoa are usually microscopic in size, certain aggregated protozoans can occasionally be detected through the gross visual examination of fish. Sporozoan cysts (*Wardia* spp. in fresh water; *Glugea* spp. in brackish and ocean water) present in fish viscera or muscles are examples. They are noticeable because of the size of the cyst and because the cysts are opalescent and sometimes pigmented.

b. Helminths -- The three distinct phyla of helminths found as parasites in fin fish are the Platyhelminthes, Nematohelminthes, and Acanthocephala.

(i) *Flatworms (Platyhelminthes)*. This phylum includes monogeneans which usually attach to the gills, scales, or fins of fin fish and trematodes (flukes) which form disk-shaped cysts near the skin of the fish. Trout and salmon are frequently parasitized by *Discocotyle salmonis* (Monogenea). Larval spagheti worms [*Poecilancistrum robustum* (Cestoda)] occur as large cysts in the flesh of drum and other fish of the Gulf and Atlantic coasts of the United States.

(ii) *Roundworms (Nematoda)*. Pollock and other coastal fish of Norway may be heavily parasitized by larvae of *Hysterothylacium aduncum*. Cod are routinely candled in several countries for detection and removal of macroscopic nematodes before packaging.

(iii) *Spiny-headed worms (Acanthocephala)*. These worms live in the intestine and are attached to the wall by a protrusible proboscis covered with recurved hooks; the worms vary in length from less than an inch to more than a foot. The body of individuals from most species is elongate, flattened and capable of extension. No digestive tract is present at any stage of their life cycle; food is absorbed directly from the host's intestine.

c. Copepoda -- Copepods are free-swimming microcrustacea. They are the most numerous marine crustaceans in many habitats, both in species and as individuals. Copepods are usually bottle-shaped and generally range in size from less than 1 mm up to 50 mm; One genus, *Pennella*, reaches 250 mm in length. Many species are fish parasites. Among members of the Order Lernaeopodorda, the females at one stage of development become immovable in the tissues of the host fish.

(4) Procedure: Determination of Parasites in Processed Fin Fish

a. Sample Preparation -- Each subsample should consist of 10 randomly selected 200 g portions of fish flesh per lot (portions may require compositing of fish weighing less than 200 g each). Breaded fish portions should be treated as in (iii) below to remove the breading and obtain the ten 200 g portions of fish flesh. Subsamples should be analyzed according to the multiple sampling plan [see (4)e. below]; following this sampling plan, analysis of up to three subsamples from each lot may be required. Prepare subsamples as described below:

(i) *Fresh White-Fleshed Fish* -- Remove fish skin and cut into fillets 20 mm thick or less.

(ii) *Fresh Fish with Pigmented Flesh or Processed or Frozen Fish* -- Do not fillet. Prepare breaded products as in (iii) below.

(iii) *Removal of Breeding* -- Frozen products should be thawed at room temperature in a beaker of appropriate size. After thawing, pour a hot (50°C) solution of 2 % sodium lauryl sulfate in water over the fish in increments of 100 mL per 300 g of product. Stir with a glass rod for 1 min. Allow to stand for at least 10 min or until breeding separates from the flesh. Transfer individual portions to a No. 10 sieve nested over a No. 40 sieve. Wash the breeding through the No. 10 sieve with a gentle stream of warm tap water. Examine the No. 40 sieve containing the breeding periodically, using UV light [see caution, part (4)c. below]. Parasites will appear fluorescent under this light. Note any parasites detected and record for the report. Discard the breeding by backflushing the No. 40 sieve with tap water.

b. Candling of White-Fleshed Fish -- Examine both sides of each prepared fillet on a light table. The intensity of the light must be sufficient to be transmitted through the flesh. Parasites should appear as irregularly spaced dark shadows in the translucent flesh. Parasites may be isolated for identification by dissection of the fish flesh. Isolated parasites should be fixed by the methods outlined in the specific parasite descriptions [see (4)d. below]. Suspect specimens which are not identified should be fixed in 10% formalin as in (4)d.(i) below.

c. Ultraviolet Examination of Dark-Fleshed Fish -- Visually examine each portion, de-boned or de-skinned as necessary, on both sides under a desk lamp or similar light source. A magnifying desk lamp (11 (7)) may be used. Report findings as described below. Conduct UV examination in a darkened room. Examine each portion on both sides with reflected longwave UV light (366 nm wavelength). Parasites should fluoresce blue or green under this wavelength light. Fish bones and connective tissues, which also fluoresce blue, may be differentiated by their regular distribution and shape. Bone fragments will be rigid when probed. For UV examination of breeding, see 7.B.(6)a.(v) above. Caution: Never expose unprotected eyes to UV light from any source, either direct or reflected. Always wear appropriate eye protection, such as goggles having uranium oxide lenses, welder's goggles, etc., when such radiations are present and unshielded. Keep skin exposure to UV radiations to a minimum.

d. Fixation of Parasites -- Parasites from lots which are actionable should be fixed as described below and submitted to FDA headquarters for identification.

(i). *Protozoa* -- Species of the microsporidian genera *Glugea*, *Plistophora*, and *Nosema* may be encountered as encapsulations in the fish flesh. The parasite-containing capsules are usually white and more or less globular, ranging in diameter from less than 1 mm to 5 mm. Suspected protozoan cysts should be fixed in 10% buffered formalin [10 parts 37-40% formaldehyde, 90 parts 0.1 M phosphate buffer (pH 6.8-7.2)] for further identification.

Figure V-5



CYSTS CONTAINING PARASITES IN
FIN FISH

A -- Cysts containing tapeworm larvae

B -- Female copepod (*Sphyrion lumpi* on rosefish (0.3X))

(*Trienophorus* on tullibee(0.3X))

C -- Enlarge view of A (1X)

D -- Enlarged view of B showing internal attachment by means of the *Sphyrion* (1.5X))

(ii). *Trematodes (Flukes)* -- Larvae of trematodes (metacercaria) are frequently found at or near the skin of the fish. The disk-shaped cysts of these flatworms vary in diameter from 1 mm to 3 mm and frequently are darkly pigmented (brown or black). The lanceolate larvae usually have two suckers, one anterior and the other midventral. Trematodes should be fixed in a mixture of formalin, alcohol, and acetic acid (FAA) for further identification. (FAA consists of 10 parts 37-40% formaldehyde, 70 parts 95% ethanol, 15 parts water, and 5 parts acetic acid.)

(iii). *Cestodes* -- The elongate, flattened larvae (pleurocercoids or spargana) are white to cream-colored and have an anterior holdfast organ. Unencapsulated pleurocercoids of *Diphyllobothrium latum* L. he, the broad fish tapeworm of man, are 1 to 5 mm in width and up to 20 to 40 mm in length. The encapsulated pleurocercoids of *Trienophorus crassus* Rudolphi are 2 to 4 mm wide and may be fixed in FAA for identification.

(iv). *Nematodes* -- Nematode larvae are cylindrical and highly variable in size, ranging from less than 0.25 mm to more than 100 mm in length and from 0.01 to 2 mm in diameter. Different species have different amounts of pigmentation; some appear white or cream-colored, others pinkish to red, and some tan or brownish. Some types are encapsulated and others are not; the same kind of nematode may even have some individuals encapsulated and others free in the same host. Nematodes are frequently coiled in the flesh of the fish, either in elongated spirals like a corkscrew or in flat coils. For identification, isolated nematodes should be fixed in glacial acetic acid for at least 1 hr. They should be transferred to 70% ethanol with 10% glycerol for storage and/or shipment.

(v). *Acanthocephala* -- For further identification, each larva must be dissected from its capsule and placed in distilled water for 1 hr at 2-5° C. This procedure relaxes the worm; the hydrostatic pressure causes the proboscis to evert. Cystacanths with everted proboscis should be fixed in warm (50°C) FAA.

(vi). *Copepods* -- These crustaceans are seldom found complete on marketed fish; however, the mouthparts may be found in ulcerous lesions 20 to 30 mm in diameter at the surface of the fish flesh. For identification, the affected area is cut from the flesh and fixed in 95% ethanol.

Editor's Note: Agency policy concerning sampling and criteria for regulatory action has changed considerably since the original publication of the following Multiple Sampling Plan. The plan may no longer be valid in many cases. Readers are advised to consult the Office of Seafood for current agency policy regarding sampling and regulatory actions involving parasites in fish.

e. Multiple Sampling Plan (3 subsamples)

- (i) If no parasites are recovered in the first subsample, the lot is considered passable.
- (ii) If 1 to 5 parasites are recovered in the first subsample, examine the two additional subsamples.
- (iii) If 6 or more parasites are recovered in the first subsample, the lot is actionable.
- (iv) If the average number of parasites found in the 3 subsamples is less than 2 per kg, the lot is considered passable.
- (v) If the average number of parasites found in the three subsamples is 2 or more per kg, the lot is actionable.

f. Report -- Report total number of parasites found per weight of sample(s) examined, and average number per kg. As appropriate, state identity of parasites.

[Macroanalytical Procedures Manual](#) | [Next](#)

[Foods Home](#) | [FDA Home](#) | [Search/Subject Index](#) | [Disclaimers & Privacy Policy](#)

Hypertext updated by gcz/ear/kwg/dms 2002-JUN-26

2